

Heart Rate Variability Amplitude vs. Blood Pressure

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Research Goals

1. Assess the correlation between HRV amplitude (HR_{\max} minus HR_{\min}) and conventional blood pressure.
2. Determine how blood pressure changes with resonant breathing with HRV feedback.

Method (1)

1. Open study with no limitations on age, gender, medication, health status, time of day...
2. Participants include EEG Biofeedback, Stress management clients, parents and family member of clients as well as volunteers.
3. The Study consists of 42 clients and 103 assessments.
4. Time frame 2007-2009

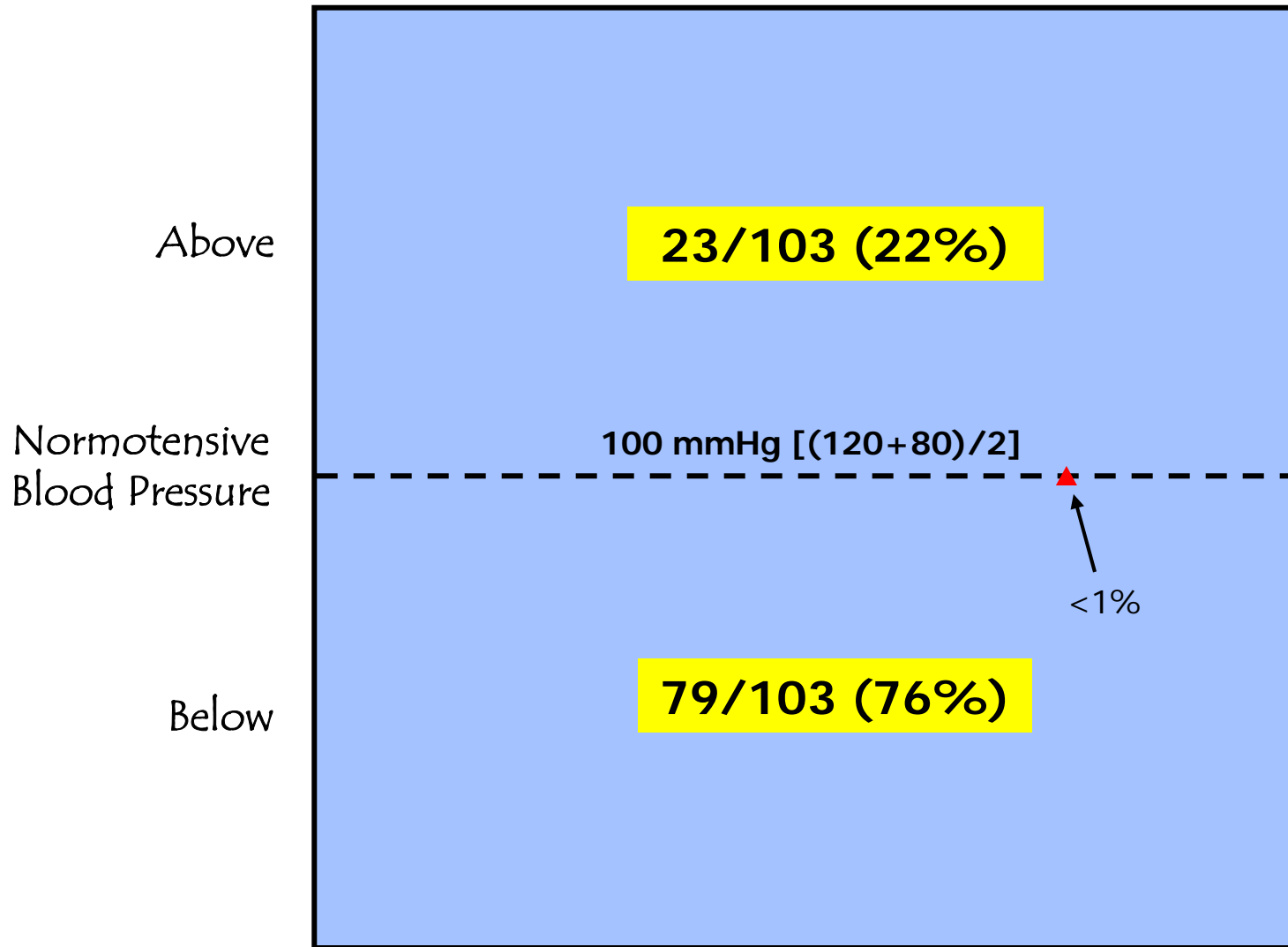
Method (2)

1. Participants have at least 10 minutes of quiet transition time prior to assessing blood pressure.
2. Participants were seated in an upright position. Blood Pressure was assessed with the arm at heart level. (Left or right arm.)
3. Blood pressure was assessed by auscultation with a standard Sphygmomanometer and stethoscope. Stethoscope placement was over the brachial artery (medial part of the cubital fossa).
4. Participants are seated in front of a monitor with a HRV Biofeedback program with a graph screen. Using a resonant breathing technique of 5 breaths per minute (equal inhalation and exhalation) for 8-12 minutes with the goal of elevating HRV amplitude.
5. Blood pressure was assessed immediately after completing the 8-12 minutes of HRV Biofeedback.

Method (3)

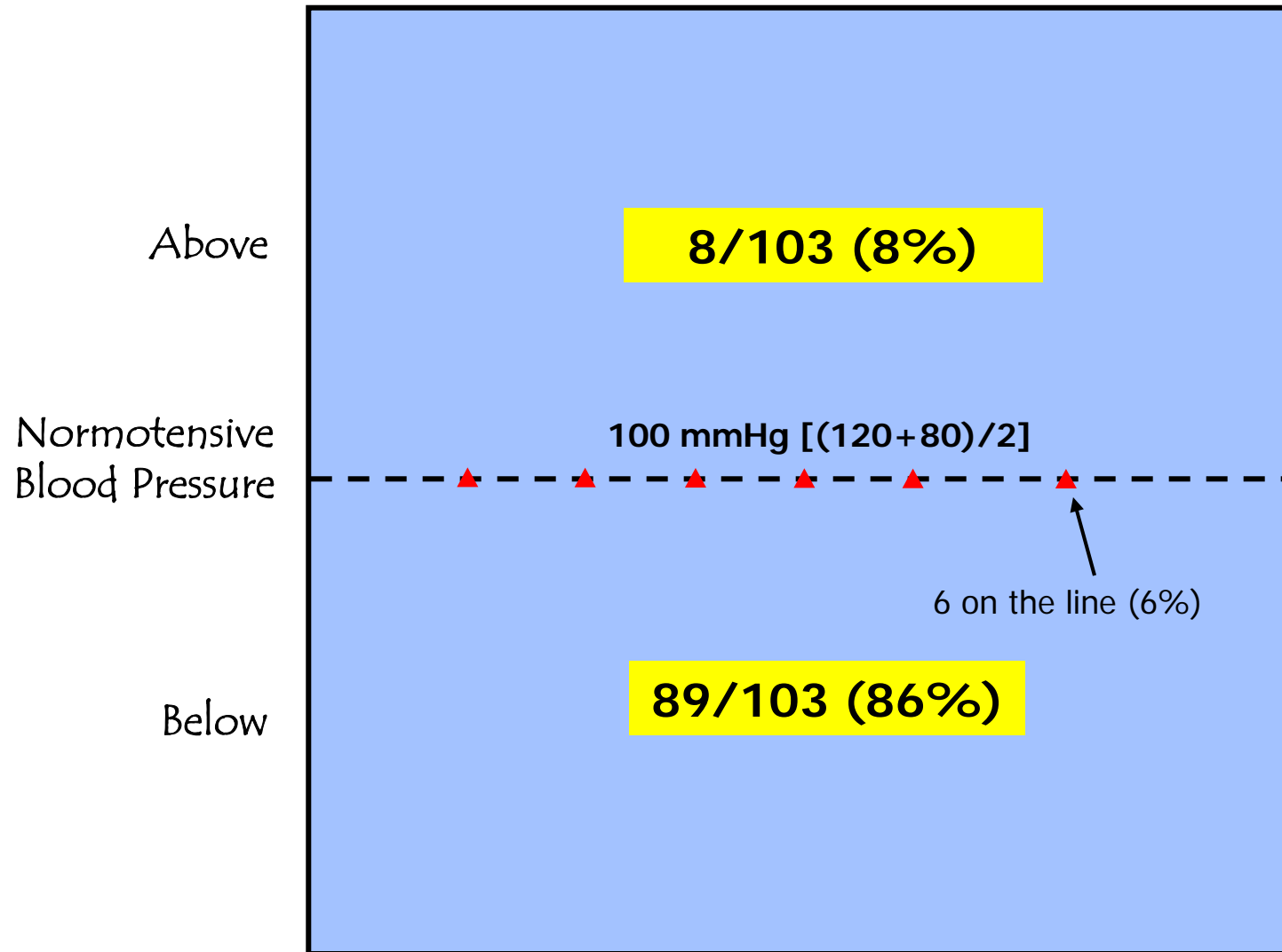
1. HRV amplitude is determined by subtracting the average peak (HR_{\max}) from average valley (HR_{\min}) heart rate.
2. Data is randomized and graphed:
 - Average blood pressure pre-session
Average Blood Pressure = [(Systolic + Diastolic)/2]
 - Average blood pressure post-session
 - Delta blood pressure pre vs. post
 - HRV amplitude
3. 4 quadrant analysis

Average Blood Pressure Pre-Session



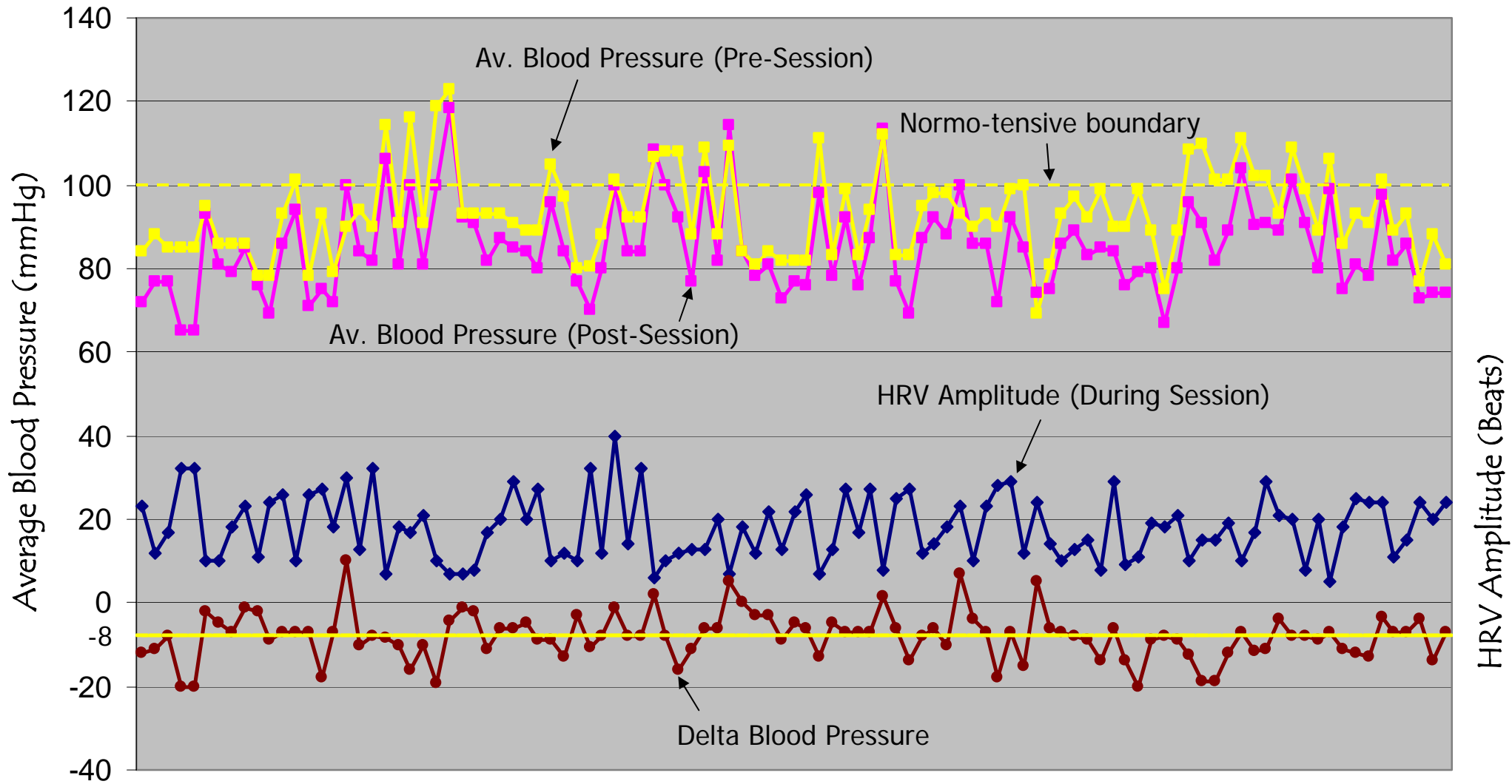
$$\text{Average Blood Pressure} = [(\text{Systolic} + \text{Diastolic})/2]$$

Average Blood Pressure Post-Session



$$\text{Average Blood Pressure} = [(\text{Systolic} + \text{Diastolic})/2]$$

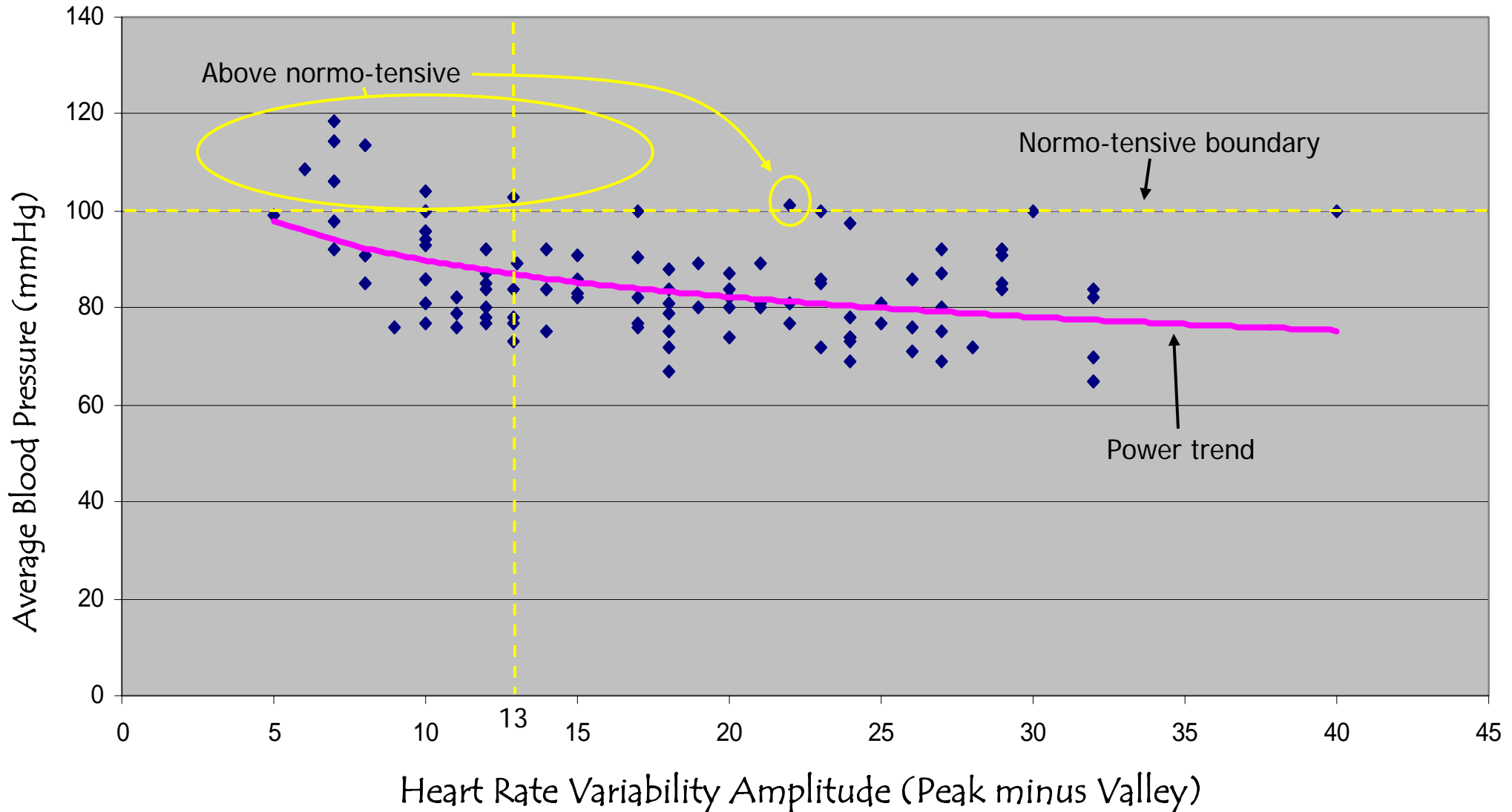
Average BP, Delta BP, HRV Amplitude



Average Blood Pressure & HRV Amplitude
(42 Subjects, 103 Assessments, Randomized Data)

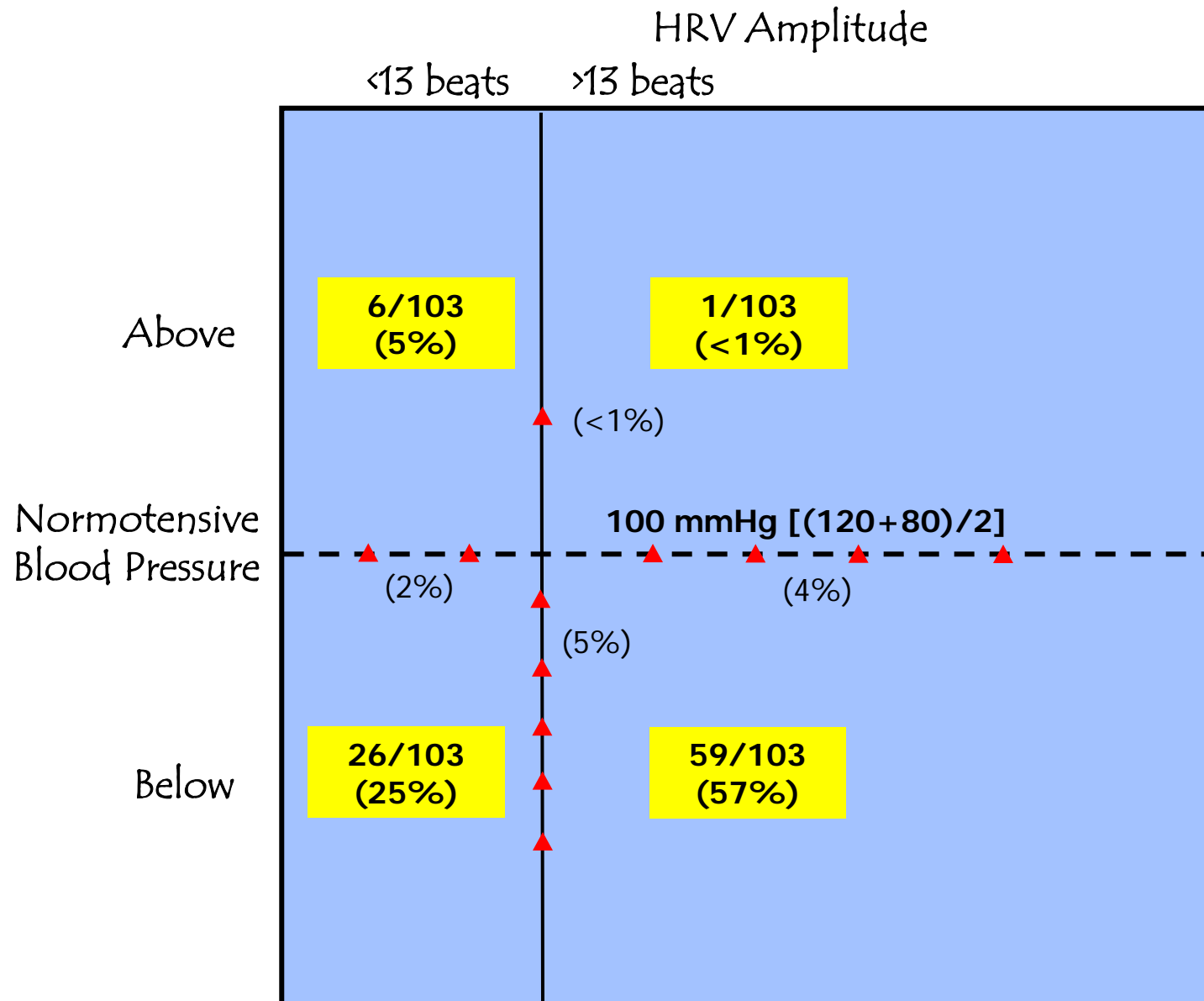
Note: Average Blood Pressure = [(systolic+diastolic)/2]; HRV Amplitude = Peak-Valley

Average Blood Pressure vs. HRV Amplitude Post Session

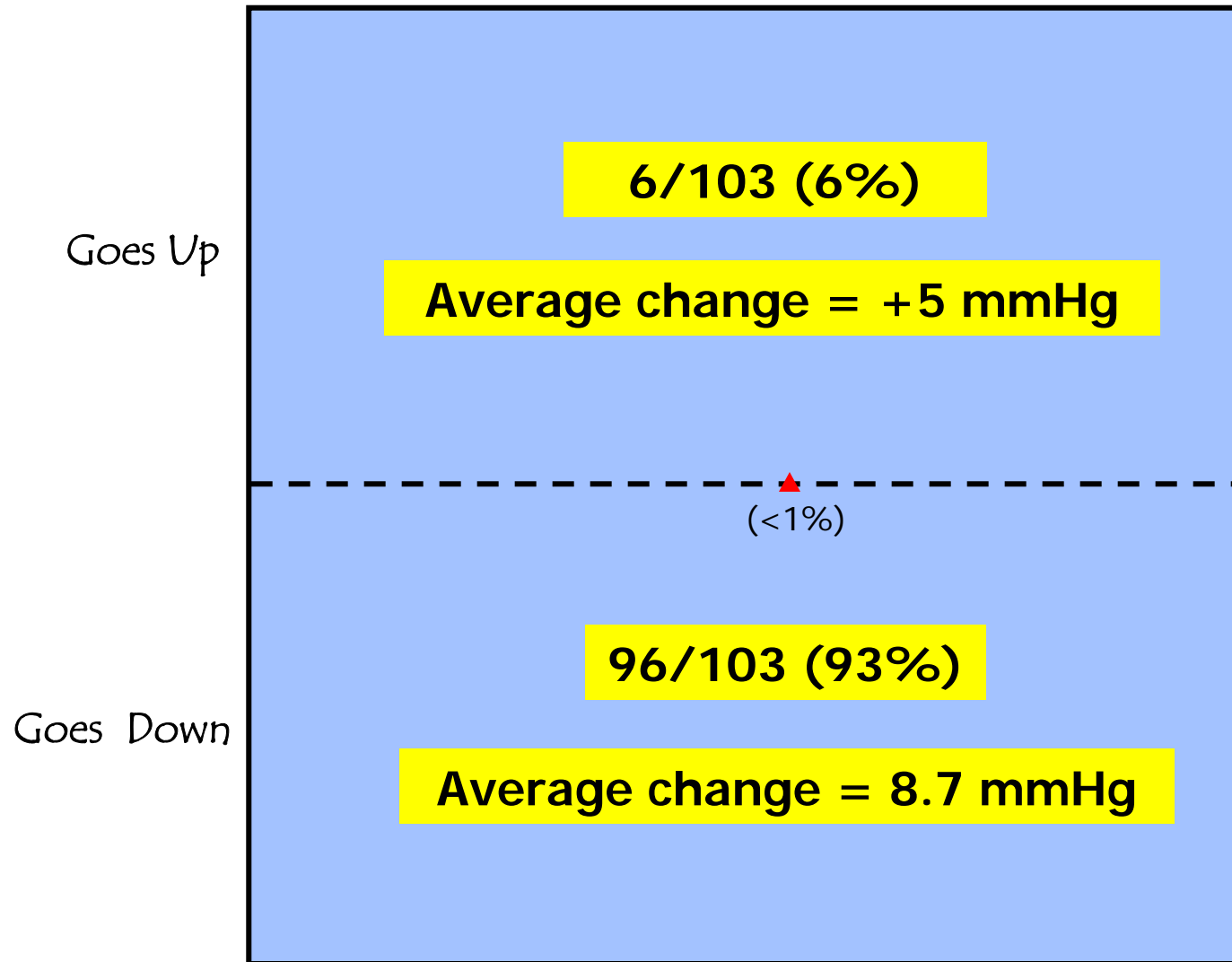


Note: Average Blood Pressure = [(systolic+diastolic)/2]; HRV Amplitude = Peak-Valley

Average Blood Pressure Post-Session vs. HRV Amplitude



Blood Pressure Changes Post Session



$$\text{Average Blood Pressure} = [(\text{Systolic} + \text{Diastolic})/2]$$

Conclusions re. Goal 1

1. Clients that exhibited average blood pressure above normo-tensive (5%), demonstrated HRV amplitudes less than or equal to 13 beats.
2. One instance where HRV amplitude > 13 beats exhibited average blood pressure greater than normo-tensive.
3. 30% of clients demonstrated HRV amplitude less than or equal to 13 beats but did not exhibit average blood pressure above normo-tensive.

Conclusions re. Goal 2

1. 23/103 demonstrated average blood pressure greater than normo-tensive prior to session; 8/103 after session, a reduction of 63%.
2. 6/103 demonstrated higher average blood pressure post-session vs. pre-session. The average positive change was 5mmHg.
3. 86/103 demonstrated lower average blood pressure post-session vs. pre-session. The average negative change was 8.7mmHg.
4. 1/103 demonstrated the same pressure post and pre session.

Thank You

Please contact either Steve or Dee for
more information.

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